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Plate cocking apparatus for sheet-fed printing press

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US3858512 A

(58) Field of search

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updated as appropriate

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INT CL[5] **B41F 27/00**

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FIG. 1

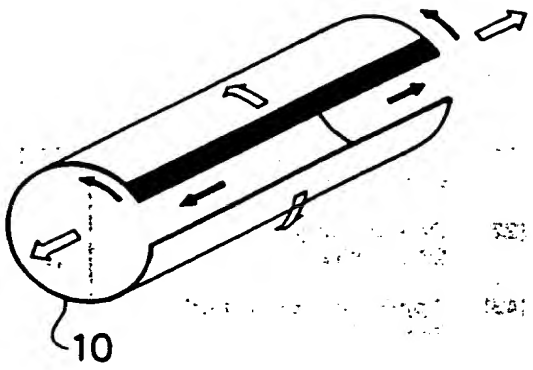


FIG. 2

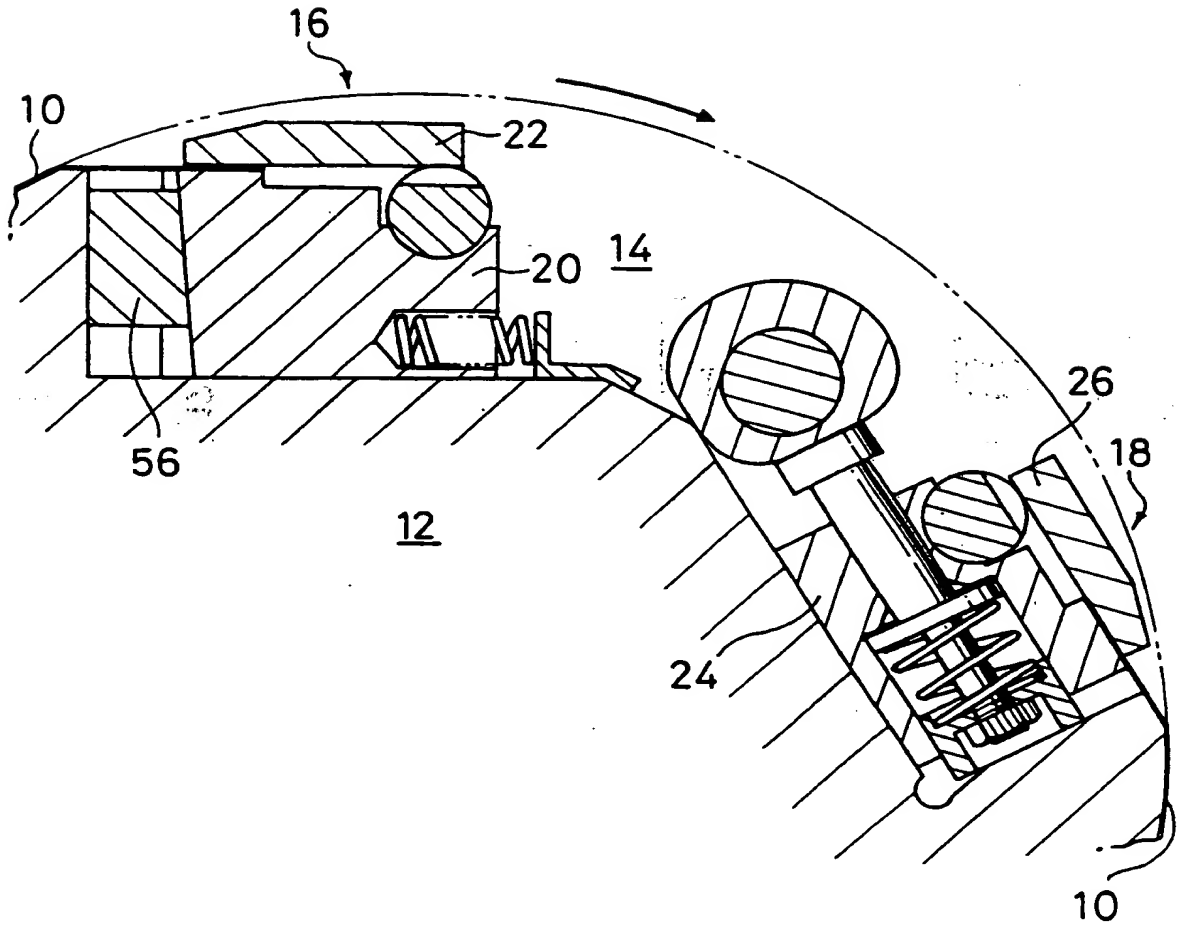


FIG.3

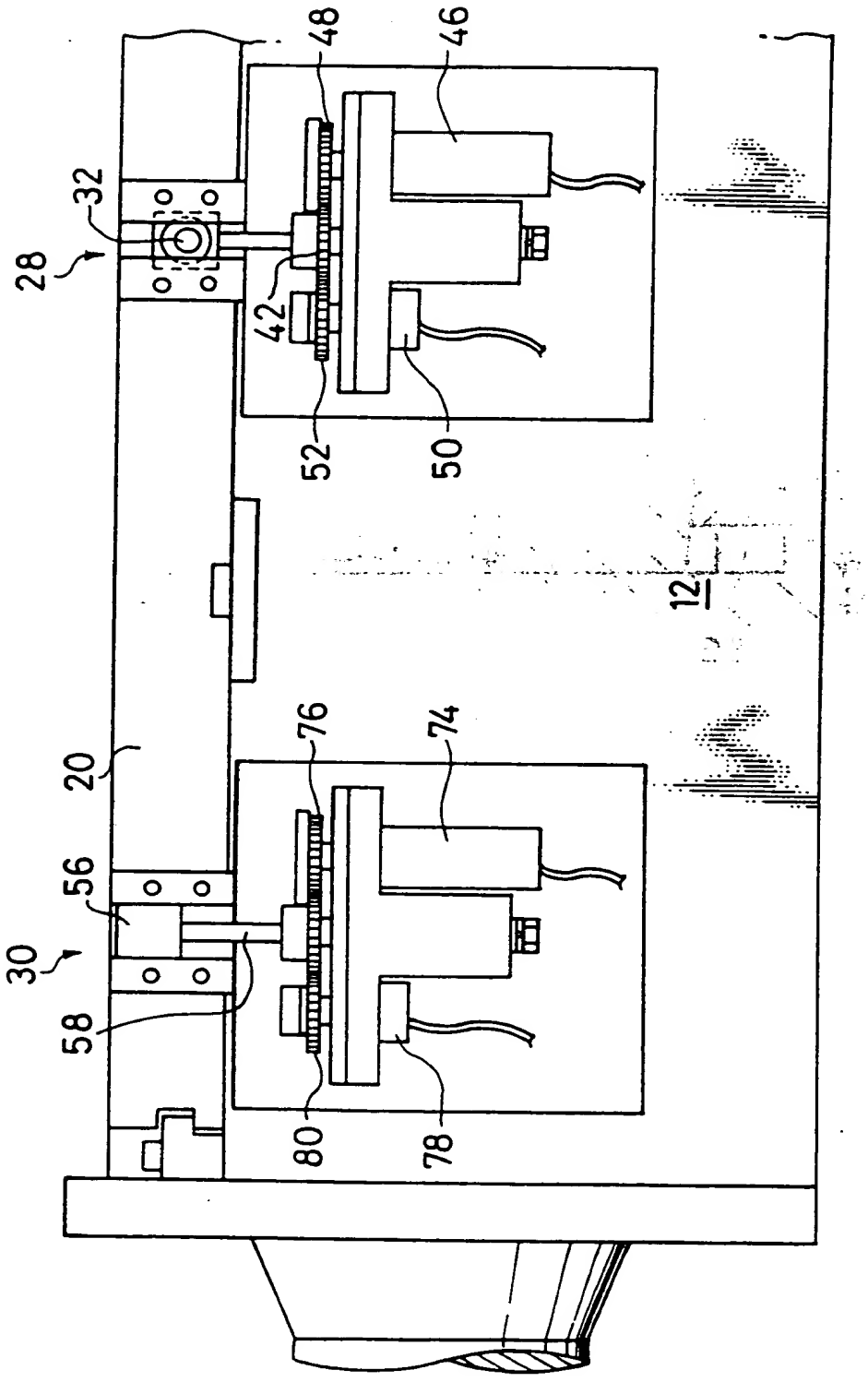


FIG.4

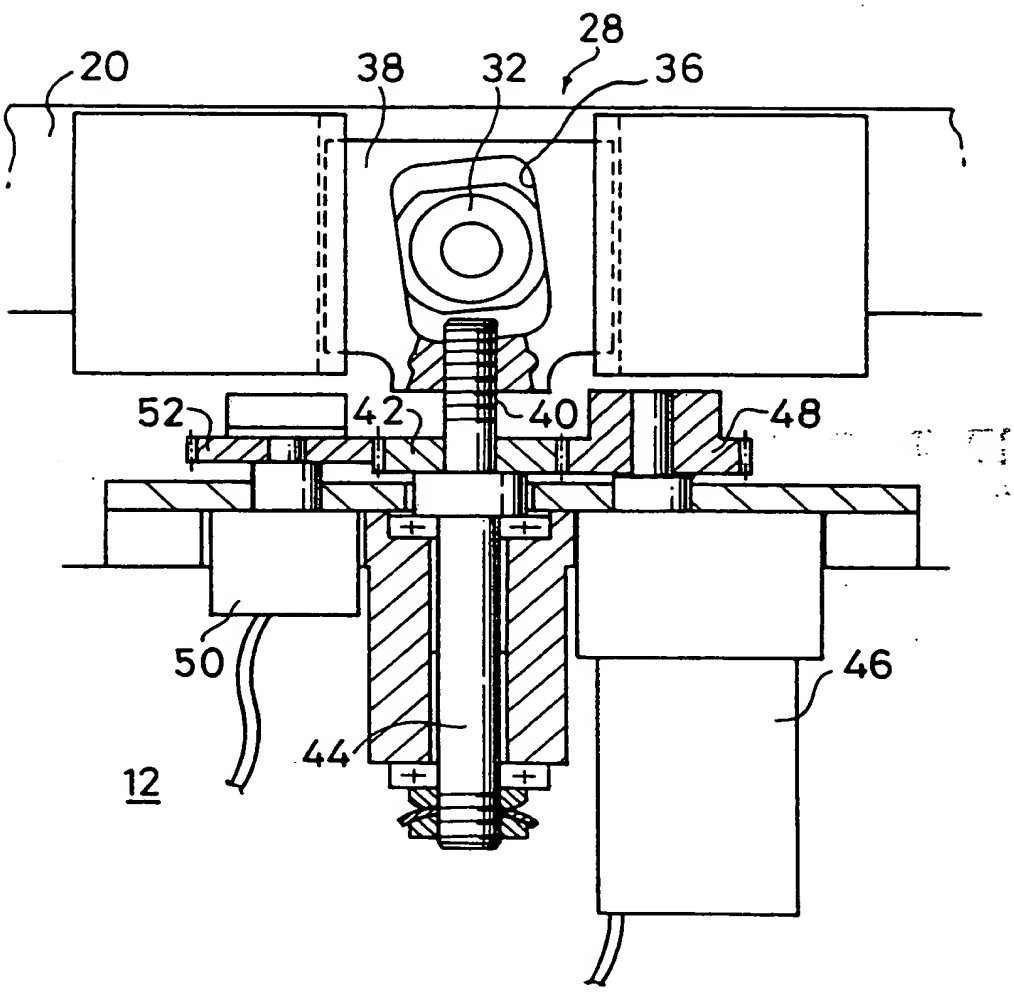
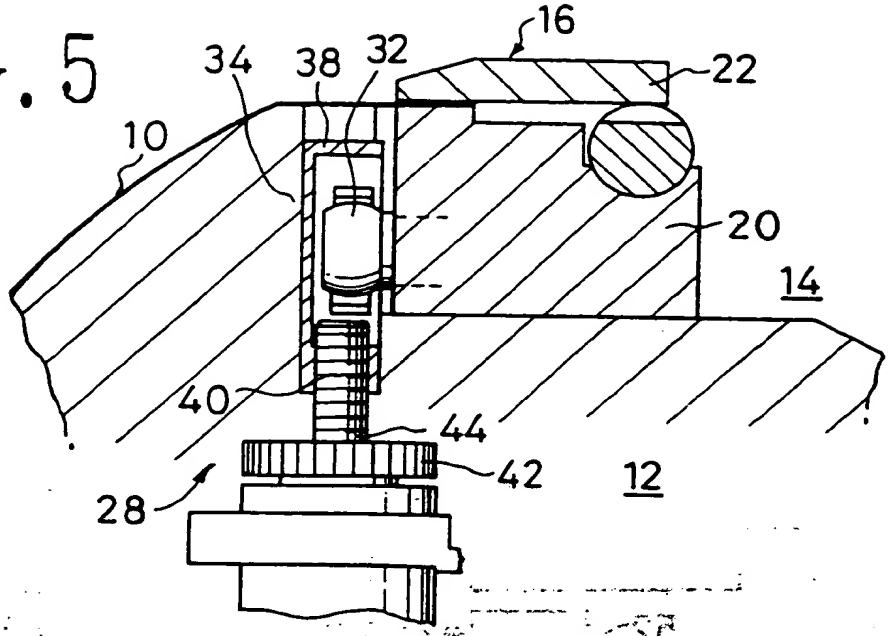


FIG. 5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34
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10
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14
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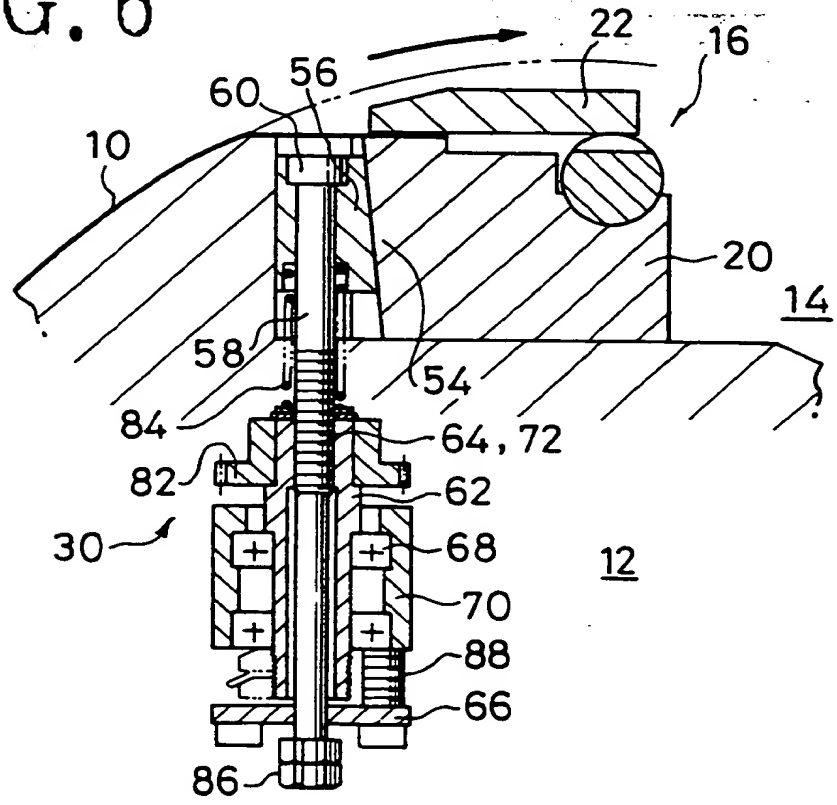
44
42
12
28

FIG. 6


22
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14
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64, 72
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62
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68
12
70
88
66
86

FIG.7

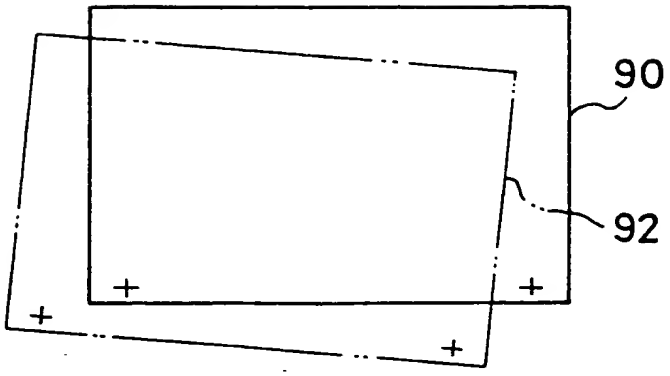

FIG.8

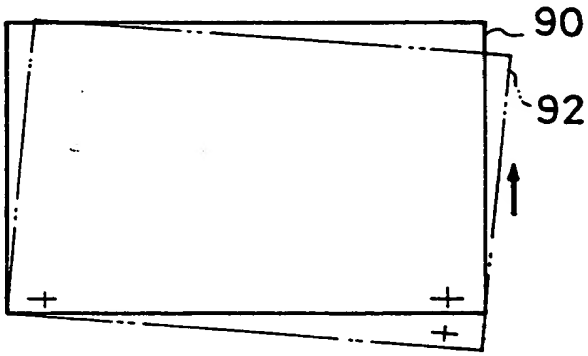

FIG.9

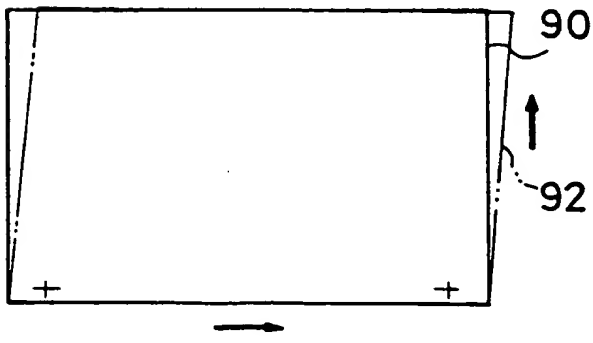

FIG.10

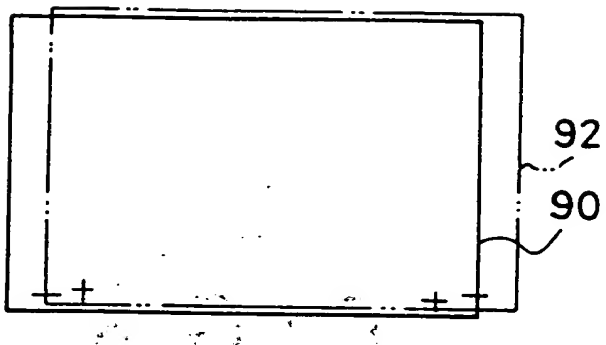

FIG.11

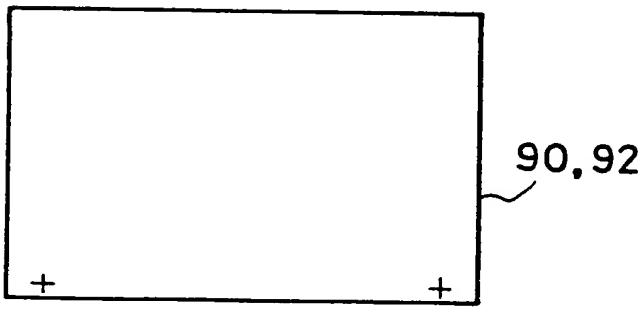

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PLATE COCKING APPARATUS FOR SHEET-FED PRINTING PRESS

This invention relates to a plate cylinder for a sheet-fed printing press, and more particularly to the provision of a plate cocking apparatus for correcting a register error resulting from distortion of a plate position.

In a multi-colour printing press, a plate is wound on each of plate cylinders that are provided in the same number as the number of colours, and printing is sequentially carried out for each colour. In this case, high printing quality cannot be obtained unless each colour printing is made sequentially at a correct position on a sheet of paper.

To obtain a correct register for each colour, criss-cross marks referred to as "register marks" are printed in a margin of the sheet of paper. A plate or a plate cylinder is register-adjusted by measuring the deviation of the register marks for each colour.

Register errors can be classified into parallel errors where the register marks deviate in parallel in horizontal/vertical direction(s) of the plate, and distortion that occurs when phase error in the horizontal direction is combined with error in the vertical direction.

As a counter-measure for parallel errors, a technique for correcting the register error by adjusting the plate cylinder itself in its axial/ circumferential direction(s) is already known, and is not the subject matter of the present invention.

As the counter-measures for the distortion, mention can be made of the manual adjustment technique which is disclosed in Japanese Patent Publication No. 53034/1988, but this technique wastes time and moreover, requires the operation of a printing press to be stopped. A cocking apparatus by so-called "plate

cylinder cocking", which is disclosed in Japanese Patent Laid-Open No. 72731/1985, applies an excessive load to the printing press and is of complicated construction.

Japanese Patent Laid-Open No. 56146/1987 discloses a hydraulic cocking apparatus for effecting so-called "plate cylinder cocking" and Japanese Patent Laid-Open No. 108046/1989 discloses a technique which integrally moves a front grip end and a rear grip end of a plate. However, both of them are complicated in structure and are not very practical.

According to the present invention there is provided a plate cocking apparatus for a plate cylinder of a sheet-fed press, the plate cocking apparatus comprising:

clamping means on an inside portion of a groove of a plate cylinder for engaging the front end of a plate wound on an outer periphery of said plate cylinder in a tensile state;

first driving means for moving said clamping means in an axial direction of said plate cylinder, said first driving means being disposed at an axially substantially central portion of said clamping means;

second driving means for moving said clamping means in a circumferential direction of said plate cylinder, said second driving means being disposed at opposite axial end portions of said clamping means; and

motorized drive means within the plate cylinder for driving said first and second drive means and causing movement of said clamping means.

Since the construction described can generate movements in the axial and circumferential direction(s) of the clamp on the front end of a plate, a register error resulting from distortion of the plate under a tensile state can be adjusted, and satisfactory printing quality can be obtained.

A preferred embodiment of the present invention will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic perspective view illustrating the movement of a plate by a plate cocking

apparatus of a plate cylinder according to the present invention for a sheet-fed printing press;

Figure 2 is a fragmentary sectional view of a plate cylinder according to the present invention equipped with clamps for a plate;

Figure 3 is a sectional explanatory view of a left half portion of a plate cylinder equipped with a plate cocking apparatus according to the present invention;

Figure 4 is an enlarged sectional view of means for moving a clamp on the front end of a plate in an axial direction of the plate cylinder;

Figure 5 is similarly an enlarged sectional side view;

Figure 6 is an enlarged sectional side view of means for moving the clamp on the front end of the plate shown in Figure 3 in the circumferential direction of the plate cylinder; and

Figures 7 to 11 are printing image diagrams useful for explaining the operation of the apparatus of the present invention.

Referring to Figure 1, for adjustment in an axial/circumferential direction of a plate cylinder (represented by a white arrow in the drawing), a plate 10 which is wound around the outer periphery of the plate cylinder is moved and regulated in its axial/circumferential direction so as to correct its parallel error, in the same way as in the prior art. Correction of the distortion of the plate 10, which cannot be corrected by such regulation of the plate cylinder, is corrected by generating combined motion in the axial/circumferential direction of the plate cylinder with respect primarily to the gripped front end (represented by thick line) of the plate 10, in accordance with the invention.

Figure 2 is a fragmentary sectional view of

the plate cylinder 10 equipped with a plate clamping device. As is well known in the art, a groove 14 is formed in the outer periphery of a plate cylinder 12 that constitutes the nucleus of a sheet-fed offset press, along with a rubber blanket and impression cylinders (not shown) in the axial direction of the plate cylinder 12 (in the vertical direction in Figure 2). A clamp 16 for clamping the front end part of the plate 10 and a clamp 18 for clamping the rear part of the plate 10 are so juxtaposed in the groove 14 as to form a pair. The clamp 16 on the front end of the plate 10, which is extended in the axial direction of the plate cylinder 12, includes a clamp base 20 capable of moving along a base wall of the groove 14 and a clamp plate 22 disposed on clamp base 20 and capable of turning up and down. The plate 10 is clamped at its front part between the clamp plate 22 and the clamp base 20 as shown in the drawing. The clamp 18 on the rear grip end comprises a clamp base 24 and a clamp plate 26 co-operating in the same manner to clamp the rear part of the plate 10.

Tensile force is applied to the plate 10 by various springs fitted to the clamps 16, 18 on both front and rear grip ends, so that the plate 10 is tightly wound around the outer periphery of the plate cylinder 12. Since the plate 10 is made of an aluminium based metal, it does not undergo deformation under the tensile force described above.

Figure 3 is a fragmentary diagrammatic view of the half of the plate cylinder equipped with the plate cocking apparatus described above. Means (indicated as a whole by reference numeral 28) for moving the clamp 16 on the front grip end in the axial direction (in the vertical direction in Figure 3) of the plate cylinder 12 is disposed substantially at the centre of the clamp 16 on the front end and means

(indicated as a whole by reference numeral 30) for moving this clamp on the front end in the circumferential direction (in the perpendicular direction to the sheet of drawing in Figure 3) of the plate cylinder 12 are disposed at the both right and left sides of the clamp 16 on the front end. As is well known, the base 20 of the clamp 16 on the front grip can move along the bottom of the groove 14 by using a combination of grooves and protuberances fitting the grooves.

Figure 4 is an enlarged sectional view of the means 28 for moving the clamp 16 on the front end of the plate 10 in the axial direction of the plate cylinder 12 and Figure 5 is similarly an enlarged sectional side view. A spherical bearing 32 is fixed substantially at the centre of the clamp base 20 in such a manner as to protrude towards the wall 34 of the groove 14. A member 38 which has an inclined groove 36 engaging twistably with the spherical bearing 32 is so guided as to be capable of moving only in the vertical direction (up/down direction in Figure 4) relative to the clamp base 20 and is disposed between the clamp base 20 and the wall 34.

On the side of the plate cylinder 12, on the other hand, there is rotatably mounted a rotary shaft member 44 which has a screw-threaded end 40 engaging the member 38 and which carries a gear 42. The gear 42 of this rotary shaft member 44 meshes with a gear 48 of an electric motor 46 so as to drive the rotary shaft member 44, and with a gear 52 of a potentiometer for measuring the extent of rotation.

As can be seen clearly from Figure 4, when the member 38 having the inclined groove 36 is moved in the vertical direction by the rotation of the rotary shaft member 44, driven by the motor 46, the clamp base 20 having the spherical bearing 32 meshing with the

inclined groove 36 is moved in the horizontal direction as viewed in Figure 4, that is, in the axial direction of the plate cylinder. Thus the motor 46 which applies the turning torque to the rotary shaft member 44 is incorporated in the plate cylinder 12. Accordingly, only power needs to be supplied from outside the plate cylinder 12, and mechanical linking such as described in Japanese Patent Laid-Open No. 190736/1991 is not necessary.

Figure 6 is an enlarged sectional side view of means 30 for moving the clamp 16 on the front end shown in Figure 3 in the circumferential direction of the plate cylinder 12, and such means 30 are disposed independently at both the right and left hand end portions of the clamp 16 at the front end of plate 10. As described already, the clamp base 20 is allowed to move in the axial direction (perpendicularly to the plane of Figure 6) and in the circumferential direction (in the horizontal direction as viewed in Figure 6) of the plate cylinder 12 along the bottom of the groove 14, while receiving the force of the spring (previously referred to) and the tension in the plate 10.

The clamp base 20 has an inclined side portion 5A. A wedge member 56 having a surface which is inclined in the opposite direction to the inclined side portion 54 and guided movably in the vertical direction (in the up and down direction of Figure 6) relative to the clamp base 20 is interposed between the wall 34 of the groove 14 and the inclined side portion 54 of the clamp base 20. Thus, when this wedge member 56 is moved in the vertical direction, the end portion of the clamp base 20 is moved in the circumferential direction relative to the plate cylinder 12.

To move the wedge member 56 in the vertical direction, a shaft 58 extends freely through a hole in the wedge member 56, a head 60 of the shaft 58 being

received in a recess at the upper end of the hole. The shaft 56 has a screw-threaded portion 64 engaged in a threaded hole in a rotary member 62 intermediate the ends of the shaft, rotation of the shaft being prevented by a base plate 66 on the side of the plate cylinder 12, movement of the shaft in only the vertical direction being permitted.

The rotary member 62 is supported for rotation in a holder 70 through a bearing 68 and has fixed to it a gear 82 meshing with the gear 76 of a motor 74 shown in Figure 3 and with a gear 80 of a potentiometer 78. Motor 74 and potentiometer 78 operate in the same way as the means 28 for moving the clamp 16 on the front grip end in the axial direction of the plate cylinder 12.

A compression spring 84 surrounding shaft 58 is interposed between the upper part of the rotary member 62 and the bottom of the member 56 and urges the member 56 in the upward direction.

When the rotary member 62 is rotated by the motor 74 and the shaft member 58 meshing with this rotary member 62 is moved downward in the vertical direction of Figure 6, the wedge member 56 is pulled down against the force of the spring 84. Accordingly, one of the ends of the clamp base 20 is moved to the left in Figure 6 and the plate 10, too, moves correspondingly. To move one end of the clamp base 20 to the right in Figure 6, the motor 74 is rotated in the reverse direction and only the shaft 58 is first returned to its original up position while the pulling force of the plate 10 is released (e.g. at the time of removal of the plate 10). Then, the member 56 rises and returns to the original position until it is stopped by the head 60 of the shaft 58. At this time, the clamp base 20, too, moves to the right and returns to the original position. At this time, the return function of

the shaft member 58, the wedge member 56 and the expanding spring 84 prevent any excessive force from acting on the plate 10 and improves manoeuvrability. Reference numeral 86 denotes a stop nut on the shaft 56 and reference numeral 88 denotes a bolt for fixing the holder 70 to the base plate 66.

Next, the function will be explained with reference to printing image diagrams of Figures 7 to 11. To simplify the explanation, the description will be given of the case where the printing image (represented by 90) in a first printing unit and the printing image (represented by 92) in a second printing unit in multi-colour printing are deviant from each other as shown in Figure 7, by way of example, but it will be understood by those skilled in the art that the operation can be similarly applied to other cases, as well. In this case, the side provided with register marks corresponds to the front end of the plate 10.

First of all, the plate cylinder 12 is adjusted in both axial and circumferential directions and the printing images at this time are adjusted so that their register marks on one of the sides coincide with each other as shown in Figure 8. Next, in order to bring the register marks on the other side into conformity with each other, the means 30 for moving one of the ends of the clamp 16 on the front grip end of the illustrated apparatus corresponding to the right hand side of Figure 8 in the circumferential direction of the plate cylinder 12 is actuated. Specifically this means 30 is that shown in Figure 6 the operation of which has been described.

As a result, the register marks on the front grip end of the plate 10 coincide with one another on both right and left sides as shown in Figure 9, but the printing image 92 by the plate 10 of the second printing unit is distorted in a parallelogram shape.

Accordingly, the plate 10 is cocked by operating both the means 28 for moving the clamp 16 on the front end of the present apparatus in the axial direction of the plate cylinder 12 and the means 30 for moving it in the circumferential direction at only one side. Thus, the state is reached where only the parallel error is left, as shown in Figure 10. Therefore, the plate cylinder 12 is again adjusted in the axial/peripheral directions and finally, both printing images 90 and 92 completely coincide with each other as shown in Figure 11. In this way, cocking of the plate 10 is completed.

The plate cocking apparatus illustrated is of simple construction and is easy to operate and yet provides a significant advantage in that the register error can be corrected completely by generating the combined motion in the clamp on the front grip end. Since the electric driving source is incorporated in the cylinder plate, troublesome linking with an outside power source is not necessary, and cocking can be freely carried out during the operation of the printing press. Moreover, the movement of the position of the plate based on the combined motion generated in the gripped front end of the plate can be rapidly applied throughout the plate as a whole by the pushing force of the rubber blanket cylinder which comes into contact with the plate cylinder.

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CLAIMS

1. A plate cocking apparatus for a plate cylinder of a sheet-fed press, the plate cocking apparatus comprising:

clamping means on an inside portion of a groove of a plate cylinder for engaging the front end of a plate wound on an outer periphery of said plate cylinder in a tensile state;

first driving means for moving said clamping means in an axial direction of said plate cylinder, said first driving means being disposed at an axially substantially central portion of said clamping means;

second driving means for moving said clamping means in a circumferential direction of said plate cylinder, said second driving means being disposed at opposite axial end portions of said clamping means; and

motorized drive means within the plate cylinder for driving said first and second drive means and causing movement of said clamping means.

2. The plate cocking apparatus according to claim 1, further comprising a potentiometer means connected to said first and second drive means for measuring movement of said first clamping means.

3. A plate clocking apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

DOCKET NO: A-2865

SERIAL NO:

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